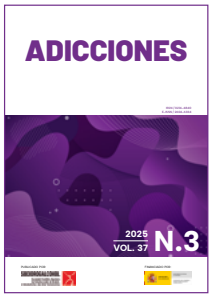
SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2025 ■ VOL. 37 ■ N. 3 ■ PAGES 269–284
www.adicciones.es



ORIGINAL

Social media addiction, personality, psychopathology and gender: Cross-sectional and longitudinal findings in adolescents

Adicción a redes sociales, personalidad, psicopatología y género: Hallazgos transversales y longitudinales en adolescentes

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Abstract

Social media addiction (SMA) is associated with a wide range of psychological problems in adults, but there are fewer studies about its impact on adolescents. A first step for SMA research in adolescents is to develop instruments to properly examine SMA among them. So the first aim of the current study was to explore the psychometric properties of the Bergen Social Media Addiction Scale (BSMAS) among Spanish adolescents. The study also examined the role of personality in SMA, the associations between SMA and mental health both cross-sectionally and longitudinally, and how these associations may be affected by gender and when personality is considered. A sample of 616 adolescents participated in the study (mean age = 15.01, *SD* = 1.17, 309 girls), with 1-year follow-up with 222 of them. The BSMAS emerged as a psychometrically sound instrument to assess SMA in adolescents, and showed proper evidence for construct and criterion-related validity, invariance between genders and excellent internal consistency. SMA was related to extraversion, neuroticism and low agreeableness in boys, and to neuroticism, extraversion and lower conscientiousness, openness and agreeableness in girls. SMA showed cross-sectional and longitudinal associations with many psychological problems, with differential associations appearing according to gender, but most disappeared when considering personality. Accordingly, disordered gaming and defiant behaviors predicted SMA after controlling for personality. These findings show the importance of using longitudinal designs and considering personality and gender when examining SMA development and its relations with psychological problems.

Keywords: social media addiction, psychometric validation, five-factor model of personality, psychopathology, comorbidity, adolescence

Resumen

La adicción a redes sociales (ARS) se asocia a un amplio rango de problemas psicológicos en adultos, aunque su impacto en adolescentes ha sido menos estudiado. Un paso necesario en la investigación de la ARS en la adolescencia es el desarrollo de instrumentos que permitan evaluarla adecuadamente en esta etapa evolutiva. Por ello, un primer objetivo del presente estudio fue explorar las propiedades psicométricas de la *Bergen Social Media Addiction Scale* (*BSMAS*) en adolescentes españoles. El estudio también examinó el papel de la personalidad en la ARS, las asociaciones entre la ARS y la salud mental, transversal y longitudinalmente; y cómo esas asociaciones se ven afectadas por el género y cuando la personalidad es considerada. La muestra del estudio se compuso de 616 adolescentes (media de edad = 15,01; *DT* = 1,17, 309 chicas), 222 fueron seguidos un año después. La BSMAS emergió como un instrumento adecuado para evaluar ARS en adolescentes, mostrando evidencia apropiada de validez de constructo y de criterio, invarianza entre géneros y excelente consistencia interna. La ARS se relacionó con extraversión, neuroticismo y baja amabilidad en chicos; y neuroticismo, extraversión, y menor responsabilidad, apertura y amabilidad en chicas. La ARS mostró asociaciones transversales y longitudinales con un gran número de problemas psicológicos, y estas difirieron según el género. No obstante, la mayoría de las relaciones desaparecieron cuando se tuvo en cuenta a la personalidad. En este sentido, la ARS estuvo predicha por uso problemático de videojuegos y conducta desafiante una vez se controló por personalidad. Estos hallazgos muestran la importancia de emplear diseños longitudinales y considerar la personalidad y el género a la hora de estudiar el desarrollo de la ARS y su relación con problemas psicológicos.

Palabras clave: adicción a redes sociales, validación psicométrica, modelo de los cinco factores, psicopatología, comorbilidad, adolescencia

■ *Received: July 2024; Accepted: June 2025.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

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Social networking has become one of the most popular human behaviors. It is estimated that 62.3% of the world population is an active social media user, who spend an average of 2 hours and 23 minutes daily. For instance in Spain, where the present study takes place, 83.6% of citizens frequently use social networking sites (SNSs) (Kemp, 2024). The greatest use of SNSs is observed for adolescents and young adults, particularly girls (Kemp, 2024). Despite the positive functions that SNSs provide, such as social connection or entertainment, a minority of SNS users can develop the addictive symptomatology observed in other substance and non substance addictive behaviors (i.e., salience, mood modification, tolerance, withdrawal, conflict and relapse) (Griffiths, 2005). Accordingly, addictive SNSs use is defined as "an excessive concern about online activities, driven by an uncontrollable motivation that implies so much time and effort resulting in important life impairments" (Andreassen & Pallesen, 2014). As with its regular use, adolescents (Cheng et al., 2021) and the female gender (Andreassen et al., 2017) obtain the highest social media addiction (SMA) prevalence.

Many studies have shown an association between SMA and a large set of negative outcomes for adults and adolescents, such as anxiety and depression symptoms (Hussain & Griffiths, 2018; Keles et al., 2019; Marino et al., 2018), lower levels of well-being and life satisfaction (Duradoni et al., 2020; Marino et al., 2018), and poorer academic performance (Luo et al., 2021; Tsitsika et al., 2011). Very few studies are available about other psychopathological conditions of interest, especially in adolescence, such as eating behaviors problems (Imperatori et al., 2021), Internet gaming disorder (IGD) (Andreassen et al., 2016; Monacis et al., 2017), and cyberbullying and cybervictimization (Kircaburun et al., 2018a; Longobardi et al., 2020). In addition, and as far as we know, associations between SMA and other substance addictions and well-established non substance addiction (i.e., problematic gambling) are still largely unexplored.

Although the literature describes significant associations between SMA and different negative outcomes cross-sectionally, the directionality of such associations is not well-established. For instance, a longitudinal study with adolescents found that SMA predicted less life satisfaction and increased cybervictimization and depressive symptoms, but not *vice versa* (Boer et al., 2021). Nonetheless, another study in adolescent girls showed that baseline depressive symptoms predicted SMA, but not *vice versa* (Raudsepp & Kais, 2019), whereas another research work observed a bidirectional longitudinal effect between SMA and depressive symptoms (Li et al., 2018). Overall, as longitudinal studies in adolescents are rare and, in some cases, report contradictory findings, more longitudinal research is necessary to clarify the directionality of the relations between SMA and psychological outcomes.

Therefore, and regardless of researchers' assumptions (i.e., SMA predicts future negative outcomes, psychological problems lead to SMA, or both cases), there is the belief that an etiological connection exists between SMA and a wide range of psychological problems. An alternative explanation might be that these associations are due to the existence of a common factor that underlies both SMA and psychopathology, such as personality. Nowadays, the most accepted framework by personality psychologists is the Five-Factor Model (FFM) (John, 2021), which comprises the basic personality dimensions of neuroticism, extraversion, openness to experience, agreeableness and conscientiousness (Costa & McCrae, 1992). From this framework, personality is considered an important dispositional variable that makes individuals more vulnerable to a wide range of psychological outcomes, including externalizing and internalizing symptoms (Etkin et al., 2022), and addictive-related behaviors like problematic patterns of substance use (Ibáñez et al., 2008), gambling (Sharpe, 2002), video gaming (López-Fernández et al., 2020), Internet use (Brand et al., 2016) and SMA. Accordingly, two meta-analyses showed a significant relation between SMA and high neuroticism (r = .17 — .21) and low conscientiousness (r = -.15 — -.16) and, to a lesser extent, to low agreeableness (r = -.07), low openness (r = -.03 — -.04) and extraversion (r = .01 — .03) (Huang, 2022; Meynadier et al., 2024). However, the vast majority of studies recruit adult samples and do not differentiate between males and females. This is an important gap in the literature because of the possible differences in the role of personality in SMA between youngster and adults (Meynadier et al., 2024), and between boys and girls, as the evident sex differences in the SMA prevalence rates suggest (Su et al., 2020).

Most of the above-described studies employ the Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2016) to assess SMA. This 6-item questionnaire, rooted in a previous scale that assesses Facebook addiction (Andreassen et al., 2012), measures general SMA without focusing on particular SNSs, based on addictive symptomatology (Griffiths, 2005). The scale is well-validated in western and eastern countries, especially among university students. In this sense, a recent meta-analysis based on BSMAS psychometric properties confirmed its unidimensionality and provided evidences for the reliability of its scores and construct validity among 17 languages (Bottaro et al., 2025). With regards to adolescence, the instrument has also demonstrated sound psychometric properties in some countries, including measurement invariance across gender at different levels (Arrivillaga et al., 2024; Lin et al., 2017; Monacis et al., 2017). One objective of the current research was to validate the BSMAS among Spanish adolescents, yet a validation of the instrument in this specific population (Arrivillaga et al., 2024) was published during the peer-

review process of the present manuscript. We will compare our results to theirs in order to establish solid evidence on this population.

To summarize, despite this extensive research into the associations of SMA with diverse psychological problems and with FFM personality traits, it is worth highlighting some important gaps. First, despite adolescence being a crucial life stage for regular (Kemp, 2024) and addictive social media use (Cheng et al., 2021), there is scarce examination in adolescents of the most used questionnaire for assessing problematic social media use, the BSMAS. Second, most research works on the negative consequences of SMA include adult population samples, and usually focus on a limited range of psychological outcomes, such as depression, anxiety and well-being. Other psychopathological symptoms of interest, especially for adolescents, such as alcohol, eating or bullying problems, require more research attention. Third, most of these studies are cross-sectional and, therefore, directional links are not well-established in adolescents. Fourth, despite the relevant role of basic personality traits in a wide range of psychological outcomes (John, 2021), including SMA (Huang, 2022; Meynadier et al., 2024), only a few studies explore the role of this variable in adolescent SMA. Fifth, personality is a relevant factor for psychopathology and well-being (Etkin et al., 2022) and should, consequently, be taken into account when exploring associations between SMA and mental health. Last, gender differences consistently appear in personality traits (Costa et al., 2001), psychopathology (Etkin et al., 2022) and other technological addictions (Su et al., 2020) and should, therefore, also be considered in the SMA field.

The present study aims to explore the psychometric properties of the BSMAS in Spanish adolescents. The psychometrical analyses included, among others, internal consistency reliability, factor structure and the measurement invariance among genders. It also examines the role of FFM personality traits in SMA, including the possible moderating role of gender. In addition, it cross-sectionally and longitudinally examines the interrelations between SMA and a large set of psychological outcomes by considering the influence of personality and gender. Despite the exploratory nature of the current study, some general findings are expected. The BSMAS will present sound psychometric properties in Spanish adolescents, including gender measurement invariance. SMA will be related to personality, especially to neuroticism and low conscientiousness. In addition, a large number of cross-sectional and longitudinal associations will be exhibited between SMA and psychological outcomes such as disordered gaming, anxiety and depression; and most of them will be vanished when considering personality. Finally, gender will emerge as a relevant moderator in the link between SMA and other psychological variables.

Method

Participants and procedure

The researchers contacted two public high schools from Castelló de la Plana (an urban area on the eastern coast of Spain) to form the convenience sample, which participated in a larger project that examined the psychosocial risk and protective factors involved in mental health in adolescence. Trained research assistants administered the paper-pencil battery of questionnaires in the classroom in group and gave the students detailed instructions, highlighting the confidentiality of the data and the importance of giving honest responses. Once the questionnaires were returned, research assistants checked the proper completion of tests. The university's Ethical Committee approved this research work and regional authorities authorized it. The parents or legal guardians of the participants gave written informed consent in accordance with the Declaration of Helsinki.

Of the 1272 high school students invited to participate in this study, 616 completely answered the instruments related to social networking behavior and formed the final sample. Their mean age was 15.01 years (*SD* = 1.17) and 309 were girls. The follow-up of a subsample of 222 adolescents (mean age of 14.39, *SD* = 1.02; 50% girls) lasted 1 year to conduct Cross-Lagged Panel Models (CLPMs).

Measures

Social media related-behaviors. The participants reported the number of daily hours they spent on WhatsApp, Facebook, Instagram and other SNSs on weekdays and at weekends. In addition, this study applied the BSMAS (Andreassen et al., 2016) to measure the addictive use of social media (e.g., '… felt an urge to use social media more and more'). Each item, from the six composing the scale, scored on a 5-point scale using anchors from 1*: Never or Very rarely* to 5: *Very often*. The authors of this study translated into Spanish the original items. Then a bilingual speaker did a back-translation of the resulting Spanish version to check comparability. The instrument has been previously validated in Spanish adults (Brailovskaia & Margraf, 2022) and adolescents (Arrivillaga et al., 2024).

FFM personality traits. The study employed the 60-item version (Ortet-Walker et al., 2020) of the Junior Spanish version of the NEO-PI-R (Ortet et al., 2010) to measure the five-factor structure of personality (neuroticism, e.g., 'I often feel tense and restless'; extraversion, e.g., 'I really enjoy talking with people'; openness to experience, e.g., 'I have a lot of imagination'; agreeableness, e.g., 'I become distrustful when someone is nice to me'; and conscientiousness, e.g., 'I don't take my class obligations very seriously') to represent the majority of lower-order facets in youths aged between 12 and 17 years. Items are responded on 5-point Likert scales ranging from 0 (*Strongly disagree*) to 4 (*Strongly agree*). Once reversed items were computed, the scores of each

dimension were obtained by summing its corresponding items (12 per dimension). The scale has shown adequate psychometric properties (Ortet-Walker et al., 2020).

Disordered gaming. This study assessed pathological gaming (e.g., 'You have stopped doing your household chores to spend more time playing video games') using a scale for youths (Gentile, 2009) which was previously adapted and validated in Spanish adolescents (López-Fernández et al., 2020). The instrument comprises 11 items assessed on a 4-point Likert scale (0 = *never or almost never*; 3 = *almost always or always*).

Alcohol-related problems. This study also included the Alcohol Use Disorders Identification Test (AUDIT) (Babor et al., 2001), whose psychometric properties have been supported among Spanish adolescents (Boubeta et al., 2017). It is a 10-item instrument that measures alcohol consumption (items 1-3; e.g., 'How often do you consume alcoholic beverages?'), alcohol dependence (items 4-6; e.g., 'How often in the past 12 months have you been unable to do what was expected of you because you had been drinking?') and harmful alcohol (items 7-10; e.g., 'How often in the past 12 months have you had regrets or feelings of guilt after drinking?'). The items are responded on a 5-point Likert scales, except for items 9 and 10, on a 3-point Likert scale. The total score was employed in the present study.

Disordered gambling. This work employed a validated Spanish version (Becoña, 1997) of the South Oaks Gambling Screen revised for adolescents (SOGS-RA) (Fisher, 1993) to assess gambling-related problems (e.g., 'In the past 12 months, how often have you returned the next day to play to recover the lost money?'). The scale consists of 12 dichotomic items.

Psychopathological symptoms. The present work used the Assessment System for Children and Adolescents (SENA) (Sánchez-Sánchez et al., 2016), which assesses behavioral and emotional problems in child and adolescent populations. The inventory is a 5-point scale that goes from 0: *Never or almost never* to 4: *Always or almost always*. For the present study, the selection of subscales was as follows: aggressiveness (7 items; e.g., 'I annoy the people I don't like'), antisocial behavior (8 items; e.g., 'I sneak into places without paying') and defiant behavior (3 items; e.g., 'I do whatever I want, even if I get punished') (from the externalizing spectrum); anxiety (10 items; e.g., 'My worries last a long time'), social anxiety (8 items; e.g., 'I feel uncomfortable when others look at me') and depression (14 items; e.g., 'I enjoy things less than before') (from the internalizing spectrum); eating problems (8 items; e.g., 'I think about food too much'). Furthermore, this study also employed a subscale of victimization (8 items; e.g., 'Some classmates force me to do things I don't want to'), which assesses problems with classmates consisting in falling victim of physical and psychological violence.

Bullying. This paper uses a 7-item scale with 5 points (from 0: *Never or almost never* to 4: *Always or almost always*) to assess bullying behavior as a bully (e.g., 'My friends and I have hit or attacked some classmate'). The scale emerged as a valid tool in a previous study (Etkin et al., 2020).

Cyberbullying and *cybervictimization*. This work used an *ad hoc* 5-point scale from 0: *Never or almost never* to 4: *Always or almost always* to measure cyberbullying —e.g., 'I have annoyed a classmate over the phone or the Internet (i.e., insulting, threatening, mocking, criticizing, etc.)'— and cybervictimization —e.g., 'I have been annoyed over the phone or the Internet (i.e., being insulted, threatened, mocked, criticized, etc.)'— with six items for each one.

Life satisfaction. It also employed the Spanish version (Galindez & Casas, 2010) of the Student's Life Satisfaction Scale (SLSS) (Ash & Huebner, 1998) to evaluate life satisfaction (e.g., 'My life is going well'). It is a 7-item inventory that measures life satisfaction of youths aged between 8 and 18 years who come from different life areas. The Spanish version has shown proper psychometric properties (Galindez & Casas, 2010).

Academic performance. The participants informed about their academic grades by answering with a 5-point scale format that ranged from 0: *Normally failed* to 4: *Normally outstanding* the question: 'What grades did you obtain for the last school year?'.

Statistical analyses

In order to provide evidences about the internal structure of the questionnaire and the relationships of its scores with other variables, we followed the guideline for test validation pointed out by Sireci and Benítez (2023) on these topics.

To examine the internal structure of the Spanish version of the BSMAS, we conducted a confirmatory factor analysis (CFA). In order to compare with previous studies in adolescents (Bányai et al., 2017; Islam et al., 2022), we used the Maximum Likelihood with Robust Standard Error (MLR) estimator in Mplus 8.4 (Muthén & Muthén, 2018), what implies the treatment of variables as continuous and non-normally distributed data. We explored the one-dimensionality of the BSMAS, highly supported in different socio-cultural contexts (Bottaro et al., 2025). We applied the following to evaluate the overall model fit: Comparative Fit Index (CFI) > 0.90 (acceptable) (Marsh et al., 2004) and Root Mean Square Error of Approximation (RMSEA) < 0.10 (acceptable) (Weston & Gore, 2006). We ran multigroup confirmatory factor analyses (MG-CFA) to determine the configural, metric and scalar invariance of the BSMAS across gender to see if the construct could be meaningfully tested across groups. We used the model comparison criteria of $\Delta CFI \geq 0.01$ (Cheung & Rensvold, 2002) and $\Delta RMSEA \geq 0.015$ (Chen, 2007) to indicate any significant decrement in fit when testing for measurement invariance.

Then we conducted descriptive statistics, internal consistency indices (including McDonald's ω estimated with a macro for SPSS, Hayes & Coutts, 2020), correlations and regression analyses using version 21 of IBM SPSS Statistics. Those missing values from participants that represented less than 5% in a questionnaire were replaced with the mean score for the items remaining in that scale.

To compare the direct and partial correlations controlling for personality between the BSMAS and other psychological outcomes (i.e., psychopathological symptoms, life satisfaction or academic performance), we performed Pearson bivariate correlations and partial correlations by controlling for gender, age and personality.

Next we conducted hierarchical multiple linear regression analyses to explore the associations between FFM personality traits and SMA by controlling for gender and age in a first step. We also explored if gender moderated the associations between personality and SMA. In other words, if the relations between SMA and personality differed according to gender. Thus we included all the possible interactions between gender and personality traits in the regression model in a last step to control for potential confounders following the recommendations by Keller (2014). An interaction between gender and personality (gender x neuroticism, $\beta = .10$; $p = .007$) appeared and, consequently, we performed regression analyses separately for boys and girls.

We conducted two-wave CLPMs 1 year apart to explore the longitudinal links between SMA and other psychological outcomes in Mplus 8.4 (Muthén & Muthén, 2018) by controlling for age, gender, and with and without personality. We tested the models by gender separately.

Results

Factor structure and gender invariance of the BSMAS

We ran the BSMAS CFA with the whole sample (Model 1) and in each gender separately (Models 2 and 3). The fit indices were acceptable (see Table 1). The factor loadings of the CFA from Model 1 ranged from .57 to .81 (see Figure 1). The MG-CFA across genders showed good fit indices and minimal changes in the CFI and RMSEA when including constraints across loadings, which suggests metric invariance (Model 5). However, the comparison criteria were poor when including constraints across intercepts (Model 6). Consequently, scalar invariance was not fulfilled. Therefore, we tested partial invariance by releasing constraints to keep invariance across intercepts and by meeting the invariance of most items (Steenkamp & Baumgartner, 1998; Vandenberg & Lance, 2000). Thus minimal changes indices were satisfactory when freely estimating the intercepts from items 1 and 3, which suggests partial scalar invariance (Model 7).

Correlations to the BSMAS, descriptive statistics and internal consistencies

Table 2 depicts the correlations to the BSMAS, descriptive statistics and internal consistencies of all the study variables. The Spanish version of the BSMAS for adolescents presented good internal consistency indices (Cronbach's α and McDonald's $\omega = .82$). All the discrimination indices (item-total correlations) were over .52.

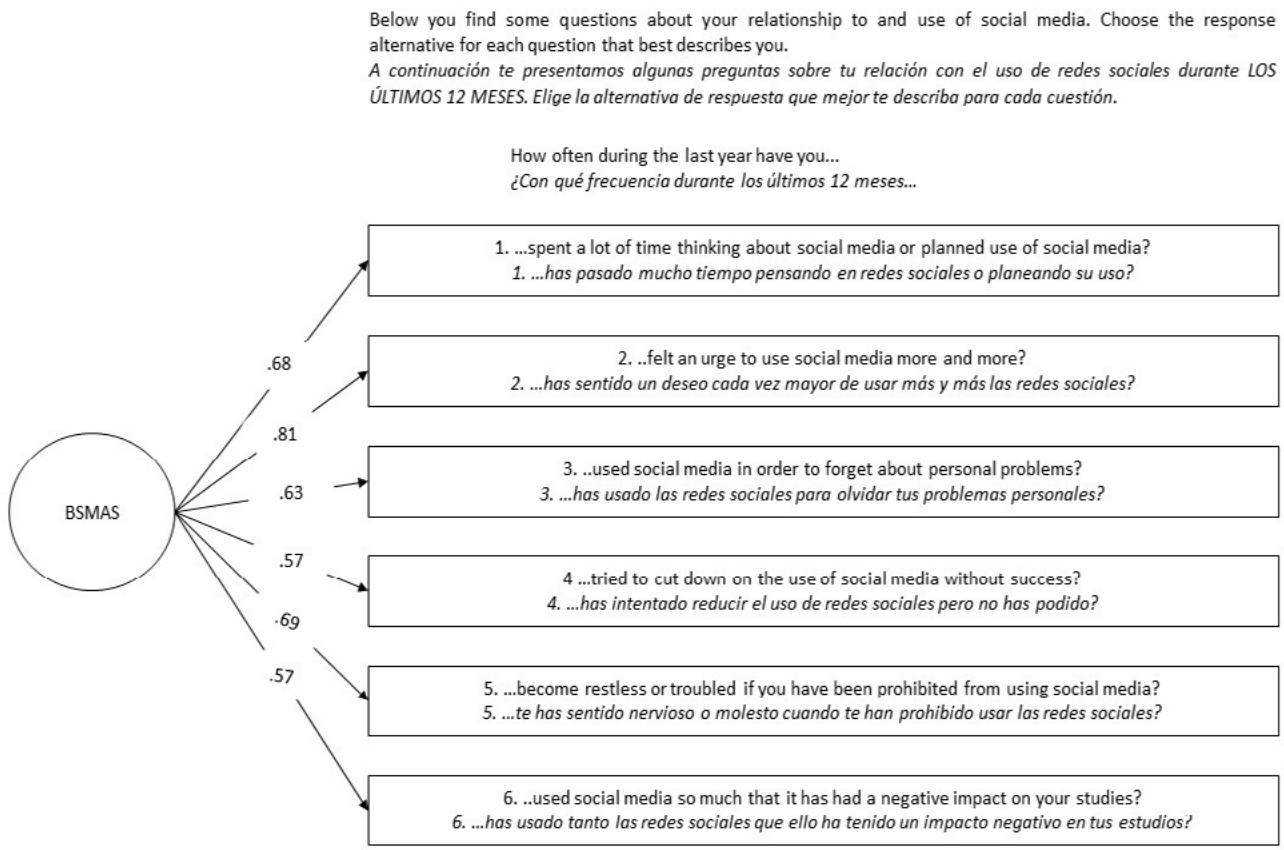
The participants reported spending a mean of 2.82 daily hours on weekdays and of 3.78 hours at weekends for WhatsApp, and 2.50 hours on weekdays and 2.77 hours at weekends for Instagram. Moreover, 8.6% and 15.8% of the WhatsApp users indicated spending more than 6 daily hours of use on weekdays and at weekends, respectively.

Table 1
Model fit and measurement invariance testing results of the BSMAS across gender

SNS users	Model		$\chi^2_{S\text{-}B}$ (df)	CFI	RMSEA	90%CI	Ref	ΔCFI	ΔRMSEA
1-factor model	1	Whole sample	50.646(9)*	.946	.087	.065 .111	-	-	-
	2	Boys	30.258(9)*	.938	.088	.055 .123	-	-	-
	3	Girls	30.221(9)*	.939	.088	.055 .124	-	-	-
Invariance testing across gender	4	Configural	60.485(18)*	.938	.088	.064 .113	-	-	-
	5	Metric	63.340(23)*	.941	.076	.054 .098	M4	.003	-.012
	6	Scalar	80.969(28)*	.923	.079	.059 .099	M5	-.018	.003
	7	Partial Scalar#	66.953(26)*	.940	.072	.051 .093	M5	-.001	-.004

Note. $\chi^2_{S\text{-}B}$ = Satorra-Bentler scaled chi-square; df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; 90% CI = 90% confidence interval of RMSEA; Ref = reference model; ΔCFI = change in CFI; ΔRMSEA = change in RMSEA.
Intercept items 1 and 3 freely estimated across groups.
* $p < .001$.

Figure 1
Factors loadings from the 6 items of the Spanish version of the BSMAS for adolescents



Note. The instructions and items in Spanish are displayed in italics.

These percentages were respectively 7.8% and 13.6% for Instagram users. The use of Facebook and other SNSs was low compared to the other two SNSs, with .17 daily hours spent on weekdays and .23 hours at weekends for Facebook and .60 and .89 hours for other SNSs, respectively.

The BSMAS scores presented moderate correlations with Instagram and WhatsApp uses (.43 and .38, p .001, respectively), and associated significantly with all the negative outcomes, except disordered gambling and victimization, with small to moderate effect sizes. In addition, the effect sizes of such associations were different according to gender. In this way, the highest association for boys appeared with disordered gaming, whereas eating problems emerged as the strongest one in girls. When controlling for gender, age and personality, only the associations with eating problems, cyberbullying and anxiety were still significant for the whole sample. When controlling for personality in the sample split by gender, the relations with disordered gaming and cyberbullying remained in boys, and the relation with depression did so for girls (see Table 2).

Users at risk and addicts

Some cut-offs have been proposed for the BSMAS in adolescents, which indicate high risk of social media engagement with a 19-point cut-off (Bányai et al., 2017) and SMA with a more stringent 24-point cut-off based on clinical diagnosis (Luo et al., 2021). Accordingly, 12.2% of the social media users from our sample would be at risk for problematic use, whereas 2.4% would be classified as addicts. It is worth stressing the substantial differences found between boys and girls, with 18.4% of girls at risk for problematic use (vs. 6.3% for boys) and 4.2% considered addicts (vs. 0.6% in boys).

SMA and personality

The hierarchical multiple linear regression analyses showed that personality related remarkably to SMA (see Table

Table 2
Correlation coefficients to the BSMAS, descriptive statistics, and the internal consistency of the study variables

	BSMAS			Mean (*SD*)				Internal consistency	
	Total	Boys	Girls	Total	Boys	Girls	*d*	ω	α
BSMAS	—	—	—	12.09 (5.04)	10.47 (4.43)	13.77 (5.10)	.69	.82	.82
Gender	**.33**[c]	—	—	—	—	—	—	—	—
Age	.01	—	—	15.01 (1.17)	15.03 (1.15)	14.99 (1.18)	.03	—	—
Neuroticism	**.34**[c]	**.19**[b]	**.37**[c]	21.20 (8.84)	19.04 (8.40)	23.38 (8.79)	.50	.84	.84
Extraversion	**.21**[c]	**.25**[c]	**.13**[a]	32.35 (7.68)	31.35 (7.46)	33.33 (7.75)	.26	.83	.84
Openness to experience	**-.08**[a]	-.08	**-.24**[c]	25.24 (8.00)	23.56 (7.51)	26.90 (8.19)	.43	.77	.76
Agreeableness	**-.17**[c]	**-.21**[c]	**-.31**[c]	36.32 (7.36)	34.98 (7.69)	37.73 (6.73)	.38	.83	.82
Conscientiousness	**-.15**[c]	**-.14**[a]	**-.29**[c]	29.76 (8.34)	28.17 (8)	31.27 (8.40)	.38	.87	.86
Alcohol-related problems	**.24**[c]/.04	**.20**[b]/.07	**.24**[c]/.02	2.37 (3.57)	2.05 (3.61)	2.70 (3.55)	.18	.82	.80
Disordered gaming	**.22**[c]/.12	**.41**[c]**/.28**[b]	**.21**[b]/-.04	4.73 (5.15)	5.76 (5.49)	2.65 (3.54)	.67	.86	.85
Disordered gambling	.03/.00	**.12**[a]/.07	.01/-.03	0.12 (0.56)	0.18 (0.70)	0.04 (0.31)	.26	.69	.70
Aggressiveness	**.10**[a]/-.10	**.13**[a]/-.11	**.26**[c]/-.15	2.19 (3.15)	2.66 (3.68)	1.65 (2.36)	.33	.74	.74
Antisocial behavior	**.14**[b]/-.01	**.21**[b]/.04	**.17**[b]/-.14	2.03 (3.26)	2.40 (3.75)	1.62 (2.69)	.24	.79	.78
Defiant behavior	**.27**[c]/.13	**.25**[c]/.09	**.30**[c]/.05	1.41 (1.81)	1.29 (1.81)	1.48 (1.76)	.11	.61	.61
Anxiety	**.32**[c]**/.14**[a]	**.15**[b]/.04	**.28**[c]/22	12.83 (9.13)	9.63 (7.53)	16.24 (9.48)	.77	.90	.90
Social anxiety	**.18**[c]/.01	.08/.01	**.16**[a]/-.06	8.61 (6.72)	7.44 (6.25)	9.90 (7.02)	.37	.86	.86
Depression	**.29**[c]/.13	**.17**[b]/.05	**.29**[c]**/.22**[a]	9.86 (9.39)	8.08 (8.10)	11.90 (10.31)	.41	.91	.91
Eating problems	**.39**[c]**/.17**[a]	**.30**[c]/.14	**.33**[c]/.17	6.40 (6.10)	4.24 (4.62)	8.70 (6.55)	.79	.81	.82
Victimization	.08/.05	**.18**[b]/.04	.03/.00	0.80 (2.30)	0.99 (2.61)	0.65 (2.04)	.15	.85	.84
Bullying	**.11**[b]/-.03	**.15**[a]/.04	**.24**[c]/-.18	1.25 (2.39)	1.65 (2.86)	0.79 (1.67)	.37	.78	.77
Cybervictimization	**.17**[c]/.08	**.23**[c]/.09	.08/.06	0.91 (2.15)	0.69 (1.79)	1.15 (2.47)	.21	.82	.80
Cyberbullying	**.15**[c]**/.15**[a]	**.25**[c]**/.22**[b]	**.15**[a]/-.09	0.59 (1.36)	0.76 (1.56)	0.43 (1.12)	.24	.65	.64
Life satisfaction	**-.17**[c]/.01	.05/**.20**[a]	**-.26**[c]/-.19	21.10 (6.14)	21.94 (5.52)	20.19 (6.60)	.29	.80	.78
Academic performance	**-.11**[b]/-.05	**-.18**[b]/-.09	**-.19**[b]/-.02	2.21 (1.08)	2 (1.07)	2.41 (1.06)	.38	—	—

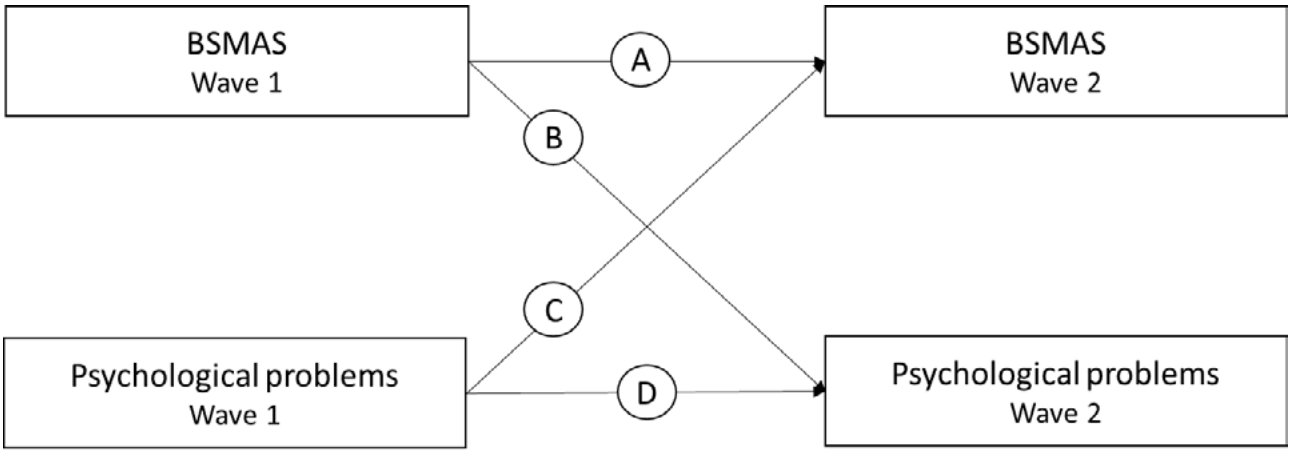
Note. Gender; 1 = boys, 2 = girls; BSMAS = Bergen Social Media Addiction Scale.
Values on the left of the slash are direct correlations.
Values on the right of the slash are for the partial correlations controlling for age and personality.
In **bold** [a] $p < .05$; [b] $p < .01$; [c] $p < .001$.
Effect size (Cohen, 1992):
For correlations; .10 = small, .30 = medium, .50 = large;
For mean differences (Cohen's *d*); .20 = small, .50 = medium, .80 = large.

Table 3
Multiple linear regression analyses of gender, age and Big-Five personality traits on the BSMAS

		BSMAS		BSMAS Boys		BSMAS Girls	
Step 1		β	ΔR	β	ΔR	β	ΔR
	Gender	.32***	.10***	—	.01	—	.00
	Age	.02		.11		-.05	
Step 2							
	Neuroticism	.27***		.17**		.35***	
	Extraversion	.25***		.31***		.24***	
	Openness to experience	-.16***	.20***	-.09	.16***	-.18***	.31***
	Agreeableness	-.12**		-.13*		-.14**	
	Conscientiousness	-.15***		-.09		-.20***	

Note. Gender; 1 = boys, 2 = girls;
* $p < .05$; ** $p < .01$; *** $p < .001$.

Figure 2
CLPMs between the BSMAS and psychological problems



Note. For clarify, the errors of the variables and their intercorrelations in each wave are not depicted in the figure.
Path A represents the stability between the waves of the BSMAS; Path B represents the effect of the BSMAS at Wave 1 on psychological problems at Wave 2; Path C represents the effect of psychological problems at Wave 1 in the BSMAS at Wave 2; Path D represents the stability between the waves of psychological problems.

3). The found association of SMA was mainly with high neuroticism and extraversion and, albeit to a lesser extent, with low openness to experience and conscientiousness. Finally, a minor relation appeared with low agreeableness. Apart from this, a strong association emerged between SMA and the female gender. Accordingly, in girls the associations between SMA and the personality traits of neuroticism, conscientiousness and openness to experience became more important.

SMA and psychological problems

The CLPMs (see Figure 2) revealed that, without controlling for personality, disordered gaming, defiant behaviors, eating problems and anxiety predicted SMA 1 year later, whereas SMA predicted higher cybervictimization and lower academic performance. All the sizes of these cross-lagged effects were large: .12 (Orth et al., 2024). In contrast when contemplating personality, the only associations to remain were those with disordered gaming and defiant behaviors (see Table 4). Despite the small sample size, the CLPMs conducted for each gender tended to exhibit gender-dependent longitudinal links (see S1 Table).

Table 4
Regression weights of the CLPMs

	Path A	Path B	Path C	Path D
Alcohol-related problems	.48[c]/.46[c]	.08/.06	.06/.05	.57[c]/.56[c]
Disordered gaming	.43[c]/.40[c]	-.06/-.09	**.18**[b]/**.17**[a]	.56[c]/.53[c]
Disordered gambling	.52[c]/.47[c]	.05/.09	-.04/-.05	.42[c]/52[c]
Aggressiveness	.53[c]/.48[c]	.05/-.03	.04/.00	.54[c]/.43[c]
Antisocial behavior	.52[c]/.48[c]	.03/-.03	.08/.05	.59[c]/.56[c]
Defiant behavior	.50[c]/.47[c]	.07/.02	**.18**[b]/**.15**[b]	.48[c]/.43[c]
Anxiety	.53[c]/.49[c]	-.05/-.05	**.12**[a]/.05	.61[c]/.53[c]
Social anxiety	.53[c]/.47[c]	-.06/-.08	.07/.03	.69[c]/.61[c]
Depression	.51[c]/.47[c]	.10/-.05	-.04/.01	.58[c]/.45[c]
Eating problems	.50[c]/.48[c]	-.04/-.03	**.15**[a]/.09	.73[c]/.70[c]
Victimization	.54[c]/.50[c]	.09/.04	.08/.05	.39[c]/.37[c]
Bullying	.52[c]/.48[c]	.04/.00	.04/-.01	.51[c]/.46[c]
Cybervictimization	.55[c]/.50[c]	**.15**[a]/.14	.00/-.03	.35[c]/.34[c]
Cyberbullying	.54[c]/.49[c]	.11/.10	.02/-.02	.45[c]/.44[c]
Life satisfaction	.53[c]/.47[c]	-.02/.03	-.06/-.01	.62[c]/.56[c]
Academic performance	.53[c]/.47[c]	**-.13**[a]/-.05	-.06/-.01	.62[c]/.51[c]

Note. Estimator is maximum likelihood. Significant cross-lagged relations are shown in **bold**.
Values on the left of the slash are for the model when controlling for age and gender.
Values on the right of the slash are for the model when controlling for age, gender and personality.
[a] $p < .05$; [b] $p < .01$; [c] $p < .001$.
Effect size (Orth et al., 2024); .03 = small, .07 = medium, .12 = large.

Discussion

The present study aimed to test the psychometric properties of the BSMAS in a sample of Spanish adolescents. This research also focused on showing relations between FFM personality traits and SMA, which may largely explain the numerous cross-sectional and longitudinal associations between SMA and other psychological problems found in the literature and also herein explored. Finally, it examined gender-dependent influences in such interrelations.

The Spanish version of the BSMAS replicated a one-factor solution with acceptable fit indices for the model performed by the CFA, providing essential evidence of construct validity and, therefore, reflecting that the test properly represents the conceptual variable, as well as excellent reliability. These findings are consistent with previous studies in adults (Bottaro et al., 2025) and adolescents (Arrivillaga et al., 2024; Lin et al., 2017; Monacis et al., 2017). In MG-CFA terms, the results of testing invariance across gender showed that both boys and girls similarly interpreted the BSMAS construct, which provided configural invariance, metric invariance and partial scalar invariance (Putnick & Bornstein, 2016). In another sample of Spanish adolescents, Arrivillaga et al. (2024) followed different criteria to explore gender invariance measurement of the BSMAS. As for scalar invariance, the authors found that most of the indicators supported invariance and suggested the suitability of gender comparisons, as we do. In any case, some methodologists have recently argued that full invariance as prerequisite for valid group comparisons is somehow overstated (Robitzsch & Lüdtke, 2023). Currently, in the assessment of Internet-related addictions on Spanish adolescents, researchers have validated the gold-standard instruments that are commonly employed in the literature. That is the case of the BSMAS for SMA, the Compulsive Internet Use Scale to measure problematic Internet Use (Ortuño-Sierra et al., 2024), and the Internet Gaming Disorder Scale–Short Form for IGD (Beranuy et al., 2020; Sánchez-Iglesias et al., 2020).

Some studies have estimated cut-offs for risky and addictive uses for the BSMAS in representative samples of adolescents from western and eastern countries. For example, 4.5% of Hungarian adolescents were at risk of problematic use (Bányai et al., 2017), whereas 3.5% of Chinese adolescents were clinically considered addicts with a stricter cut-off (Luo et al., 2021). When taking these cut-offs as a framework, the data from our adolescent sample showed that 12.2% and 2.4% of Spanish adolescents could be considered at risk of problematic use and addiction, respectively. These data fall in line with the results from a meta-analysis based on SMA prevalences from 32 nations, which found a general 5% SMA prevalence when adopting conservative classifications, and 13% for less severe classifications (Cheng et al., 2021). In line with previous research (Andreassen et al., 2017; Kircaburun et al., 2018b; Su et al., 2020), it was noteworthy that there were important gender differences in such prevalences, with 18.4% and 4.2% of girls from our sample at risk for problematic use and addiction respectively, unlike the prevalences in boys respectively with 6.3% and 0.6 %.

Concerning the link between SMA and specific uses of SNSs, Instagram was the most associated SNS with SMA, which is consistent with previous research (Kircaburun et al., 2018b). Thus Instagram may present structural characteristics that make it more addictive than other SNSs, such as focusing on self-expression by sharing editable photos and stories to reflect, being rewarded, and leading a satisfying life that does not have to match real life. In line with this, self-presentation gratifications have been closely related to problematic social media use (Chen & Kim, 2013; Tang et al., 2022). Further research should include other SNSs with strong self-expression features, such as TikTok, which is closely related to SMA in adolescents (Marengo et al., 2022).

Regarding personality, SMA was related to neuroticism, extraversion, low agreeableness and low conscientiousness, as it was in previous meta-analyses mainly focused on adult samples (Huang, 2022; Meynadier et al., 2024) but to a greater extent (except for the link with low conscientiousness, which virtually presents the same value). These stronger relationships between personality and SMA in adolescents may reflect how adolescence is a sensitive stage for regular and addictive social media use (Cheng et al., 2021; Kemp, 2024). More interestingly, and as with disordered gaming (López-Fernández et al., 2020), a differential pattern of associations between SMA and personality appeared according to gender with: girls showing significant associations between SMA and neuroticism, extraversion, low conscientiousness, low openness and low agreeableness; boys presenting significant relations with extraversion, neuroticism (to a lesser extent than girls) and low agreeableness. These data suggest that, especially for girls, problematic social media use is developed mainly to cope with daily problems and internalizing symptoms, such as anxiety and depression (Andreassen et al., 2016; Hussain & Griffiths, 2018; Keles et al., 2019; Kircaburun et al., 2018b; Marino et al., 2018). Furthermore, both boys and girls tend to participate in social networks due to the social interaction that their use entails by, for example, employing likes, comments or instant messaging (Choi et al., 2017). This leads extrovert teenagers to have more friends on social media, to perform more disclosure activity, and to have more frequent status updates (Kim & Chock, 2017), which may develop problematic engagement at these ages. Additionally, there was a link between low openness and SMA in girls, which suggests that girls with more intellectual curiosity spend more time with unconventional or infrequent alternative activities than social networking (Schwaba et al., 2018). Low conscientiousness was also relevant in SMA in girls, which implies that more disinhibited females might have difficulties with self-regulating the time spent on social media and reconciling this leisure activity with life obligations, as with other addictive behaviors (López-Fernández et al., 2020). Last, previous studies explain a significant association between SMA and low agreeableness for both genders, which suggests that agreeable people may construct offline social relationships easily, which may prevent them from problematic social media use (Huang, 2022; Kircaburun, 2016).

Regarding the association between SMA and psychopathological outcomes, SMA showed significant associations with a large set of psychopathological symptoms and life problems, as previously reported, such as: disordered gaming (Bottaro et al., 2025); anxiety, social anxiety, depression and ADHD symptoms (Bottaro et al., 2025; Chen et al., 2019; Hussain & Griffiths, 2018; Keles et al., 2019; Marino et al., 2018); eating problems (Imperatori et al., 2021); aggression, bullying, cyberbullying and cybervictimization (Kircaburun et al., 2018a; Longobardi et al., 2020; Martínez-Ferrer et al., 2018); life satisfaction (Boer et al., 2021; Duradoni et al., 2020); academic performance (Luo et al., 2021; Tsitsika et al., 2011). The present study also reports relations between SMA and other psychopathological problems scarcely explored in the literature, specifically alcohol-related problems and defiant and antisocial behavior.

However, when controlling those relations for personality, they were strongly attenuated and most of them disappeared. Some of the small, but significant, associations between SMA and psychological problems that remained were eating problems with SMA, with a tendency observed in both boys and girls. Anxiety and marginally depression were also associated with SMA, but the effect was mainly for girls. A relation between disordered gaming and cyberbullying and SMA appeared, but only in boys. These results suggest that most of the

association between SMA and negative outcomes usually described in the literature may be attributed to common personality characteristics that affect both SMA and other psychopathological variables. For instance, irresponsible and disinhibited adolescents' academic performance is poorer (Mammadov, 2021) and their SNSs use is more unregulated (Meynadier et al., 2024). Likewise, adolescents high in neuroticism present more internalizing symptoms, such as depression and anxiety (Etkin et al., 2022; Williams et al., 2021), along with more problematic SNSs use (Meynadier et al., 2024).

Longitudinal analyses replicate, in part, these data and add information about the possible directionality of associations. Without considering personality traits, disordered gaming, defiant behaviors, eating problems and anxiety predicted SMA 1 year later, whereas SMA predicted cybervictimization and poorer academic performance, which fall in line with some previous studies (Boer et al., 2021; van den Eijnden et al., 2018). However, when controlling for personality, only relationships disordered gaming to SMA (with a similar effect size for both genders) and defiant behaviors to SMA (only in girls) remained significant (see S1 Table). Thus in the present sample, disordered video game engagement would reinforce problematic social networking, probably because of the social interaction motives that underlie both behaviors (Kircaburun et al., 2018b; López-Fernández et al., 2022). Moreover, girls with a strong disposition against authority may develop SMA, in part, because of their lack of submission in front of parental control and higher parent-adolescent conflict (Khodarahmi et al., 2023). Thus working on a satisfactory parent-adolescent relationship, based on mutual confidence, may be essential to prevent and treat SMA (Shek et al., 2018). In this vein, caregivers' reactive restrictions toward the Internet is a risk factor for SMA (Geurts et al., 2022), and an increase in the quality of communication about smartphone use with parents reduces adolescents' problematic smartphone use (Efrati et al., 2024).

As for specific theoretical models in Internet addictive disorders, the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2016) emerges as an integrative framework where different components interact to explain the development and maintenance of these addictive behaviors. Within the model, personality is considered a vulnerable psychological factor that, as we have empirically demonstrated in the present study, may substantially explain the high comorbidity between Internet addictions and other psychopathology forms found in the literature. In this line, some personality traits may be common risk factors to Internet addictions, such as higher neuroticism linked to coping motives of use and impulsivity related to more loss of control; whereas other personality traits may be vulnerable factors to certain Internet behaviors and contexts (such as the case of extraversion in adolescent SMA).

This study is not without its limitations. First, the high schools that participated in the research were selected at convenience. Second, our longitudinal sample was somewhat limited in number, especially when split by gender. So these results should be taken cautiously. Third, the use of self-report instruments is subjected to biases like memory recall or social desirability, and future research could collect data directly from smartphones to obtain more reliable results.

This present research shows the psychometric properties of the BSMAS scores in a sample of Spanish adolescents, including sound evidence for internal consistency, invariance across gender, and satisfactory evidence of construct and criterion validity. This latter comprised an extensive nomological network including SNSs uses, gender, personality traits and psychological problems. In this manner, the current study also unravels the role of personality in SMA, and its relevance for explaining cross-sectional and longitudinal associations between SMA and other negative outcomes widely found in the literature. Furthermore, gender-dependent effects in such associations appear. Overall, although our data suggests a small or negligible role of SMA in psychological problems and other outcomes, it is possible to better identify some of these subtle effects when contemplating gender differences. Hence the present study underscores the role of gender and personality when exploring the associations between SMA and different psychopathological symptoms and other psychosocial outcomes. These findings can be useful for developing personalized preventive and intervention programs for SMA in adolescence. In this context, educational centers are paramount for conducting primary preventive programs and, consequently, averting the development of Internet-related addictions, so prevalent at younger ages.

Acknowledgments

The author(s) disclose(s) receiving the following financial support for the research, authorship, and/or for the publication of this article: RTI2018-099800-B-I00 from the Spanish Ministry of Science, Innovation and Universities; MCIN/AEI/10.13039/501100011033/FEDER, UE (project Number: PID2022-141808OB-I00) Government Delegation for the National Plan on Drugs (project Number: 2023I036); AICO/2019/197 from the Valencian Regional Government; UJI-B2020-42, UJI-A2019-08, UJI-B2022-29, E-2018-16, and the individual funding of the European Union – NextGenerationEU MGS/2021/02 from the Universitat Jaume I. They also wish to thank the students, parents and teachers from the high schools El Caminàs and Bovalar for making this study possible.

Conflict of interests

The authors declare no conflicts of interests.

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